

Use of simulators in the Swiss Armed Forces Evaluation of the impact on training, costs and the environment

Key facts

The objective of the audit was on the one hand to take a snapshot of the current status of the roughly 100 simulators and simulation systems in the Swiss Armed Forces, and on the other, to demonstrate their impact on training, costs and the environment based on six simulation systems.

Simulators are an important part of military training

The Swiss Armed Forces, which are organised as a militia system with short periods of military service, are from one of the leading nations worldwide in matters relating to training using simulators. This is no coincidence. Due to external factors such as the country's small size and dense population, Switzerland was forced to resort to simulators early on. Furthermore, the short training periods result in increased use of simulators. Moreover, certain constraints (security, environment, etc.) require some activities to be carried out exclusively or increasingly on simulators. In reality at present, it is rarely possible anymore to carry out staff exercises which involve big units of around 10,000 people due to logistic requirements and the high level of resource commitment. Simulators allow an alternative for handling topics and exercises of this nature.

Overall simulator investment volume is approximately CHF 2 billion

With the exception of command simulators, the procurement of a simulator system is often linked to a weapons system and may thereby lead to additional investments. The investment volume of the simulator systems currently used and operated by the Swiss Armed Forces is approximately CHF 1.7 billion. Taking into consideration the associated infrastructure, an investment volume of over CHF 2 billion should be assumed. The system costs (procurement and value retention) represent the most considerable cost factors at 75% on average. The rental and other operating costs amount to approximately 25% of the annual overall costs. The lifespan of a simulator is directly related to the corresponding real system: so long as the real system is in use, the simulator will also be required. When the real system undergoes an upgrade, the simulator must also be upgraded accordingly.

An overarching strategy for the use of simulators is currently lacking

The provisions for the use of simulators are defined in the military and technical requirements and in the deployment and training concepts, for example. In the meantime, the Swiss Armed Forces have no overarching strategy for the use of simulators in training. A strategy of this nature is now to be defined within the scope of the project «Preservation of skills in leadership training using simulators 2020». In the process, simulators are to be integrated in the comprehensive training concept of the armed forces taking into account increased participation of civil partner organisations and the promotion of national cooperation. The decisions taken within the scope of this project will be decisive for future investments, particularly in the area of command simulators.



The practical benefits for training are undisputed by all involved parties

The SFAO found that the quality of simulator training is undisputed for all user groups (operators, trainers, experienced users and Brigade Commanding Officers) and that the advantages clearly outweigh the disadvantages. Regardless of the type of simulator (driving, flight, shooting or command), training on simulators is appreciated. In particular, the high quality of training and the specialist skills of the trainers are highlighted. In spite of the fact that each simulation is more or less realistic, the level of realism of the activities which were practised on the simulators was considered to be positive overall by those surveyed. Practising on simulators is perceived to be a useful supplement to training on the real system or to activities in the field; regular use of simulators in training is desired.

Training on a simulator is not necessarily something which saves time, but a simulator allows people to practise more intensively, more repetitively, more precisely and free of time constraints. The training documentation, the instruments and the trainers have a positive influence on the level of training. To what extent a lorry driver drives better after training on the driving simulator or to what extent battalion exercises are led better in the field after a training course on the tactical simulator for mechanised units in Thun, cannot be answered. There are no reviews or analyses of this. For all of those surveyed, the positive training effect simulators have is beyond question, however.

Training controls throughout the armed forces are currently lacking

Various aids are available for assessing training services and training success depending on the simulator system. In the case of driving and flight simulators, completed lessons are checked automatically and concomitantly by the system. In addition, certain tests on the simulator ensure successful training. In the case of command simulators, fact-based practice discussions are carried out using notes prepared in a targeted manner.

However, statements about the level of training of the various troops as well as the individual service members are currently possible only to a very restricted degree due to a lack of training controls throughout the armed forces. The benefits of training controls are dependent on clear and measurable training requirements being formulated within the scope of the training concept for the armed forces.

Simulator capacity utilisation in part below the assumptions at the time of procurement

The number of course attendees varies according to the troop branch and function. Every year, for example, up to eight new and forty existing jet pilots are trained on the F/A-18 flight simulator, whereas thousands of service members are assigned to the basic training or advanced training services simulator support for combat exercises. To assess economic efficiency, however, the numbers alone of people trained are not decisive. Capacity utilisation should also be noted.

In the case of some simulators, the SFAO noted that the level of capacity utilisation of the systems envisaged at the time of procurement has not been reached today. Consequently, capacity utilisation was adjusted downward during the course of time in the training concepts and curricula. This is due, for example, to the reduction in the troop branches or the changes in training requirements, such as refraining from using simulators for refresher courses. Furthermore, a small number of training courses in Kriens using the electronic tactical simulator and command simulator 95+ were cancelled at short notice as a result of bottlenecks in connection with guidelines on days on duty.



What is more, use by third parties which was considered partially at the procurement stage is scarcely being implemented.

The planned armed forces reform will have an impact on the economic efficiency of simulators

The planned reduction in armed forces resources from 140,000 active service members to 100,000 will have an impact on future basic and advanced training and thus on the use and the economic efficiency of simulation systems. Due to the fact that there will be fewer people to train depending on the troop branch and function, capacity utilisation of the costly infrastructure and simulation systems will decline and idle periods will increasingly occur. It is therefore desirable that the existing systems are used as intensively as possible or where necessary that locations which are no longer needed are shut down. In light of cost-effective operation of simulation systems, it is also important that armed forces senior management lay down clear guidelines on training for soldiers as well as officers and the frequency with which training has to be completed.

The financial advantages of simulators have not been documented

It is frequently noted in armament dispatches and in various specialist armed forces articles on simulators in the Swiss Armed Forces that training on a simulator is less expensive than training using real equipment. Savings of up to 90% can be achieved. However, reliable and complete figures to back up statements of this nature have not been presented to the SFAO.

But it stands to reason that simulators use less ammunition for example, there is less wear and tear on the vehicles or instruments, less petrol is used and environmental pollution is less in terms of noise, harmful substances and damage to land. On the other hand, however, there are the high investment costs, maintenance costs and operating costs of simulators. Looking at simulators from a purely financial standpoint makes little sense because procurement in the Federal Department of Defence, Civil Protection and Sports (DDPS) is not decided purely on a cost basis but also for reasons to do with training. The aim of using simulators is to conduct training efficiently and effectively in the limited time available.

The question as to what extent training on a simulator is less expensive than with the real system cannot be answered in general terms. The following two examples illustrate how cost comparisons between a simulator and the use of real appliances or an actual exercise in the field provide a limited indication.

One hour of training on the simulator for motorcyclists is considerably more expensive than the rate of a private driving school. On the other hand, the cost per kilometre of the driving simulator for the armoured tracked vehicle 2000 is lower than the mileage of a tank. It should be noted that the armed forces have a high number of drivers to be trained in a short period of time. Added to this is the corresponding equipment and infrastructure which is required and thus some down periods have to be accepted. Without the driving simulators, it must be assumed that once again more driving lessons would occur in real machines and more driving instructors would be required. As a result, the wear and tear on lorries and tanks would increase, which in turn would lead to additional service and maintenance costs.

The cost of a training course on the electronic tactical simulator for the officers of a battalion or for a big staff exercise at brigade level on the command simulator 95+ amounts to several hundred thousand Swiss francs. Simulator exercises of this nature should be put into context with the real-

life exercises. However, the detailed financial information required is not available. In spite of the considerable cost of simulation exercises of this nature, it can be assumed that the use of command simulators, which sometimes represent several thousand members of the armed forces, are more efficient and, on the whole, more cost-effective than real field exercises.

The extent of the specific (positive) impact on the environment is not quantifiable

There is no data or statistics available on the extent of the impact of simulators on the environment. It was thus not possible for the SFAO to assess the specific impact. Numerous examples show, however, that practising on a simulator as opposed to using the real machine or carrying out an exercise in the field can have a very positive impact on the environment if at the same time there is less practice conducted in the field. This is why, as a result of the shift to training lessons on a simulator in the basic training for motorcycle and tank drivers, fewer lessons occur using the real vehicle today than in the past. Furthermore, in the case of certain types of weapon, less live ammunition is used today than in the past. In addition, both of the command simulators in Kriens and Thun allow for practising and training to be carried out at all times without placing a burden on the environment and the population.

The recommendations for the attention of the DDPS

The SFAO has drawn up the following recommendations for the DDPS:

- An overarching strategy for the use of simulators in training must be drawn up. Up until then, new procurement projects should be given careful consideration and the promotion of standardised systems should be sought.
- With regard to using the existing simulator systems as effectively and efficiently as possible and taking into account the reduction in armed forces resources, it should be clarified to what extent
 - international training cooperation ventures are possible
 - the use by third parties can be realised increasingly
 - the use of service members in the case of advanced training is appropriate
 - the frequency of use for the troops can be defined bindingly
 - the shutting down of simulators must be taken into account
- The current regulations on days on duty should be reviewed and graduated in accordance with rank in view of the possible implementation of a solution.
- The planned introduction of training controls throughout the armed forces should be pressed ahead with as planned.
- In the case of future procurement projects for simulators, any potential to make savings should be substantiated using transparent cost/benefit analyses. In doing so, all costs are to be taken into account and for the calculations, planning data which is realistic and not unduly high should be used.

Conclusion: high standards in the area of simulators, substantial benefits, high costs

In summary, it can be said that, compared with other armed forces, the Swiss Armed Forces have high standards in the area of simulators for training purposes. The system capabilities meet the requirements of the armed forces and the benefits for training are beyond question from the point of view of the armed forces. In modern armed forces training, they have become indispensable. However, the audit results show that the information and forecasts available at the time of pro-



curement on system capacity utilisation, the costs or cost advantages and the positive impact on the environment are in many cases too optimistic or cannot be substantiated because useful data could not be provided. High investments and high maintenance and running costs mean that training on simulators is not cheap. In line with this, before decisions are taken, economic efficiency must be comprehensively considered for new systems as well as existing ones, along with the benefits for training.

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